

CASE REPORT

Aesthetic management of a complicated crown fracture: a multidisciplinary approach

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SUMMARY

A predictable aesthetic restoration is not limited to the restored teeth; it has to include the gingival unit and its interface with the teeth involved. Orthodontic forced eruption may be a suitable approach without risking the aesthetic appearance in tooth fracture below the gingival attachment or alveolar bone crest. It is a well-documented clinical method for altering the relation between a non-restorable tooth and its attachment apparatus, elevating sound tooth material from within the alveolar socket to create a ferrule effect which is considered to be crucial for the optimal biomechanical behaviour of restored teeth. This report presents the reconstruction of a traumatised and fractured left maxillary lateral incisor by building a cast core with a cast post to perform orthodontic extrusion before placing porcelain fused to metal crown as the final restoration.

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CASE PRESENTATION

The left maxillary lateral incisor tooth of a 26-year-old man was fractured by trauma. Intraoral examination revealed that the tooth had sustained a crown-root fracture with pulp exposure. The fracture line extended below the gingival level at the palatal surface of the tooth. The adjacent teeth showed no sign of mobility, and electric pulp responses gave positive readings.

TREATMENT

The tooth was first endodontically treated by conventional methods. Orthodontic extrusion of the tooth was required as the fracture level was below the gingival margin at the palatal surface (figure 1). Before the orthodontic extrusion was initiated, postspace was prepared by conventional technique and wax patterns of the postspace and core were fabricated which were then cast. Later, a hook made up of a stainless steel 18 Ga wire was soldered on the buccal surface of the core to act as a passive component for tooth movement (figure 2).

For orthodontic extrusion of the fractured left maxillary incisor tooth, 0.18 slot straight wire brackets were attached on the left maxillary central incisor and the left maxillary canine teeth. For levelling, 0.016 nitinol archwires were placed, orthodontic elastic was placed securing the hook on the buccal surface of the cast and the archwire in the second appointment (figure 3). The orthodontic elastics were replaced at each appointment until the desired extrusion level was attained. The total

BACKGROUND

Crown fractures account for the majority of dental trauma in the permanent dentition (26–76% of dental injuries), while crown-root fractures represent only 0.3–5%.¹ Subgingival fracture of anterior tooth causes not only an aesthetic, functional and psychological breakdown but also presents restorative difficulties.

Treatment of subgingival fracture of anterior tooth often requires a multidisciplinary approach. A combination of endodontic, periodontal, orthodontic and restorative procedures may be required.^{2,3} Orthodontic extrusion is a biological way of exposure of sound tooth structure and does not alter the biological width or the position of the gingival margin of the tooth involved.⁴

Orthodontic extrusion has advantages over surgical crown lengthening, which is less conservative considering the sacrifice of the supporting bone and the negative change in the length of the clinical crowns of both the tooth and its neighbours.⁵ Orthodontic extrusion is usually achieved with fixed appliances. During orthodontic treatment, 20–30g of force is required for extrusion. However, some clinicians prefer using higher forces of 50–60g for the rapid extrusion of traumatised teeth. This rapid extrusion involves stretching and readjustment of the periodontal fibres without any marked bone remodelling. Rapid extrusion causes little or no coronal shift of marginal bone, which may complicate tooth preparation. That is why fiberotomy of the stretched supracrestal periodontal fibres has to be performed to avoid any relapse.⁶

The objective of this case report is to present the reconstruction of a traumatised and fractured left



Figure 1 Preoperative view showing fracture level below gingival margin in relation to left maxillary lateral incisor.

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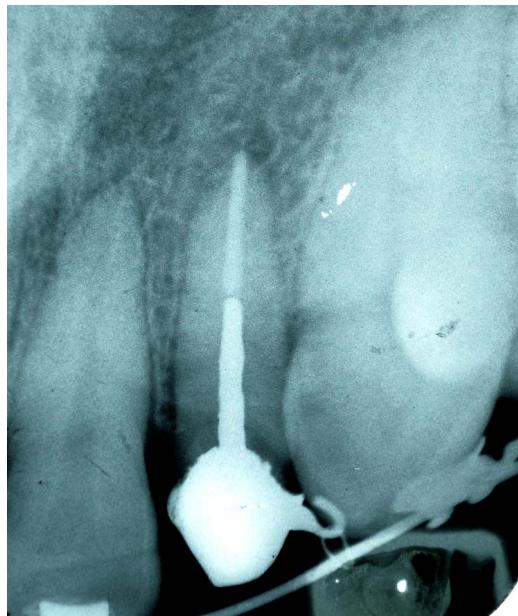


Figure 2 Root canal treated tooth having cast post and core in place containing a hook in the buccal surface of the core.

extrusion time was 2 months. The extruded tooth was retained with the same arch wire for 12 weeks to prevent any relapse. At the end of a 12-week retention period, gingivectomy and fibrotomy were performed for lingual margin exposure and better aesthetics (figure 4). Afterwards, the cast core was reduced in size and prepared for permanent restoration. Porcelain fused to metal crown was constructed over the fractured tooth with crown margins on sound tooth structure (figure 5).

DISCUSSION

The main reason for conducting orthodontic forced eruption in a traumatised fractured tooth is the requirement for sufficient tooth structure to provide a ferrule effect over sound dentin for the crown. The ferrule effect counteracts functional forces on the post core-root complex.⁷ A ferrule effect is defined as a '360° metal collar of the crown surrounding the parallel walls of the dentine extending coronal to the shoulder of the preparation. The result is an elevation in resistance form of the crown from the extension of dentinal tooth structure'.⁸



Figure 3 Orthodontic elastics in place for forced eruption of the tooth.

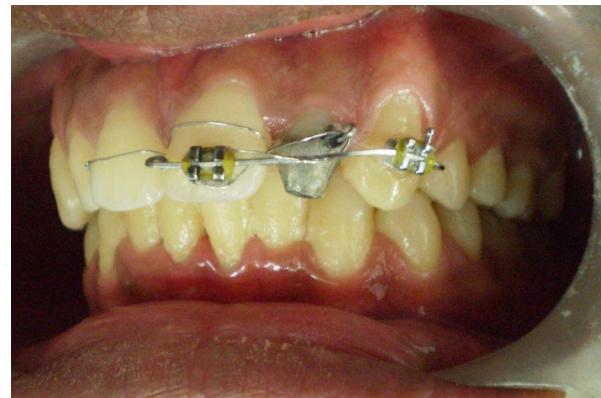


Figure 4 Retained extracted tooth with the help of arch wires for 12 weeks to prevent relapse.

According to Simon,⁹ occlusal movement of the root along with its gingiva seems to be a function of how rapidly the root is extruded and how much force is used. In case of rapid extrusion of the tooth, the periodontal fibres stretch and readjust, but the bone does not have time to remodel because of rapid movement. Thus, there is no coronal shift of the marginal bone, facilitating prosthetic restoration as there is no need to reshape bone.¹⁰ Sulcular incision, either at each appointment during extrusion process or just before the stabilisation period, is necessary to prevent bone and soft tissue movement.^{11 12}

Lengthening of the clinical crown can be performed by following three possible treatment alternatives: crown lengthening (periodontal surgery); orthodontic extrusion; and intra-alveolar transplantation of the fractured tooth (surgical extrusion). Periodontal surgery usually leads to apical shifting of gingival margin which may compromise aesthetics. Orthodontic extrusion is carried out in cases where the fracture line extends deeply in the interproximal or labial surface (up to 6 mm below the alveolar crest) and when crown lengthening would be unaesthetic. For a successful extrusion and post-treatment restoration, the distance from the fracture line to the apex should not be less than 12 mm and a crown root ratio of approximately 50:50 must be obtained. Surgical extrusion is carried out for patients who are treated on an emergency basis having severe luxation of the fractured root. With this method, the bone support around the root is usually lost.¹³

Cases requiring crown-lengthening procedures must involve a multidisciplinary approach. Emphasis should be placed on



Figure 5 Porcelain fused to metal crown was constructed over the fractured tooth with crown margins on sound tooth structure.

restorative principles which will achieve a result compatible with periodontal health. The first principle involves the establishment of marginal finish lines which are distinct, continuous and provide for sufficient bulk of restorative material to prevent overcontouring such that occlusal forces of the final restoration should be directed along the long axis of the tooth and be harmonious with those existing in the mouth. The restoration should be designed to minimise oblique or lateral forces, which tend to be destructive.¹⁴

The present technique, which combines orthodontic eruption with supracrestal fiberotomy, overcomes the disadvantage by preventing coronal displacement of the gingiva and the attachment apparatus. The influence of supracrestal fiberotomy on the retention period required after forced eruption is yet to be investigated. However, it is noteworthy that Edwards (1970) introduced a technique, later referred to by Kaplasi (1976) as 'circumferential supracrestal fiberotomy', in which a surgical blade is placed into the gingival sulcus of rotated teeth to sever the gingival fibrous attachment. This technique reduced or prevented postoperative rotational relapse.¹⁵

Learning points

- When very less crown area is present and restoration seems to be a problem, then extrusion is a very good option.
- Orthodontic extrusion is a viable and an easy method for the extrusion of teeth.
- Supracrestal fibrectomy should be performed to get better retention.
- Cases requiring crown-lengthening procedures must involve a multidisciplinary approach.
- Emphasis should be placed on restorative principles which will achieve a result compatible with periodontal health.

Competing interests None.

Patient consent Obtained.

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